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FIRST RECORD OF *CAULERPA RACEMOSA* (FORSSK.) J. AGARDH ALONG THE COAST OF GENOA (NORTH-WESTERN MEDITERRANEAN)

INTRODUCTION — In the last decades, an increasing number of not indigenous species have been recorded in the Mediterranean Sea, due both to the lessepsian immigration via the Suez Canal and to accidental introductions connected with the human activities like fishery, aquaculture, shipping (BOUDOURESQUE & RIBERA, 1994).

The genus *Caulerpa* is an interesting example of this phenomenon, although the taxonomical classification of the different species is still difficult due to their high morphological variability. The well known species *Caulerpa taxifolia* (Vahl.) C. Agardh represents a clear event of accidental introduction (MEINESZ & HESSE, 1991), while *Caulerpa racemosa* (Forsskal) J. Agardh is an example of lessepsian immigration, begun in the Eastern basin of the Mediterranean and progressively extended to the western basin (PIAZZI et al., 1994; Fig. 1 A).

In fact, *C. racemosa* is a tropical species widely distributed in the Red Sea (RAYSS, 1941; CIRIK & ÖZTÜR, 1991) and seems to show a high dynamism and adaptability to different and, also, difficult environmental conditions (DOUMENGE, 1995).

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Furthermore, this species has been recorded only once in the north-western part of the Mediterranean, near Livorno (PIAZZI et al., 1994); recently, we observed a little settlement of *Caulerpa racemosa* in front of the coast of Genoa city on rocky substrate at shallow depth. The environment in which the alga settled is affected by organic pollution. In this work we present some morphological and morphometrical observations taken from the samples collected at Genoa.

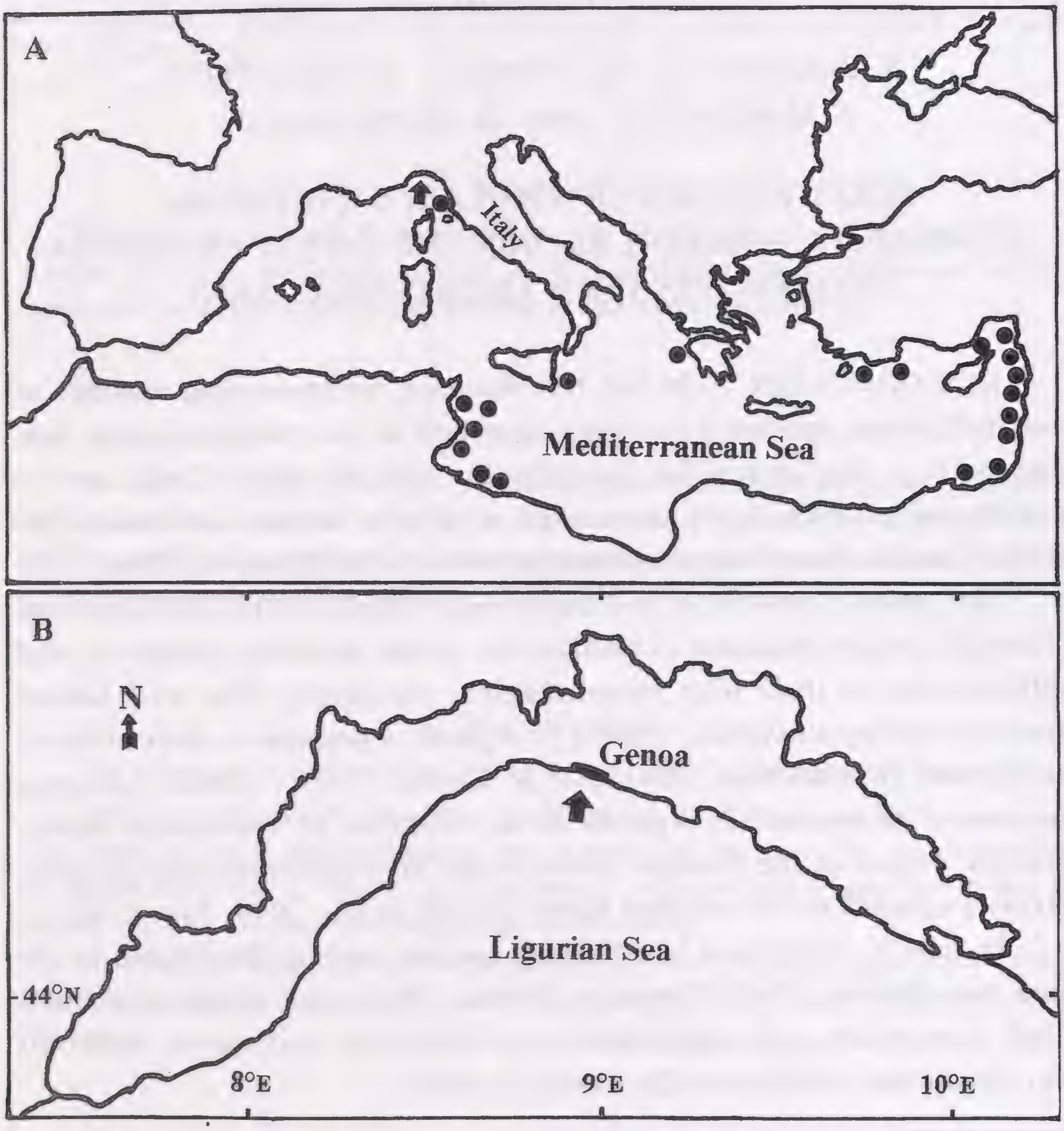

Fig. 1 A - Distribution of *Caulerpa racemosa* (Forsskal) J. Agardh in the Mediterranean sea: → our record; • previous records).
Fig. 1 B - Localisation of the settlement site at Genoa-Quinto.

MATERIALS AND METHODS — Thalli of *C. racemosa* have been observed by SCUBA diving in October and December 1995 at about 9 m depth in front of the coast of Genoa-Quinto (9°0.7' E-44°23.1' N; Fig. 1 B).

The settlement site is characterized by rocks scattered on sandy bottom.

Photographs have been taken, in situ, by an underwater camera in October and December 1995.

Samples have been collected only in December 1995.

OBSERVATIONS — At Genoa-Quinto *C. racemosa* covers the flat portion of a rock, on which a thin layer of sediment allows the fixation of the rhizoids. The alga rise also on the hard and subvertical portion of the rocks, colonizing about 4 m^2 of substrate.

The stolons cover the whole surface and the erect axes show an homogeneous and high density.

The morphology of the thalli of *C. racemosa* sampled at Genoa agrees with the description reported by PIAZZI et al. (1994) from samples taken on the rocky shoals of Meloria (Livorno, Italy).

The mean measures of the different portions of the thalli (n = 25) sampled in December 1995 are:

- thickness of stolons (mm): 1.52 (s.d.: 0.59)
- length of erect axes (mm): 10.24 (s.d.: 3.44)
- width of spherical parts (mm): 2.15 (s.d.: 0.39).

Differences in the mean dimensions have been observed between October and December 1995 (Fig. 2 A, B): during the first survey, the erect portions of the thalli appeared about 9 cm high on the average.

DISCUSSION — *C. racemosa* represents a typical example of lessepsian immigration (GIACCONE & DI MARTINO, 1995); between 1926 and 1993, this species has been recorded only in the levantine, east-central and jonian basins of the Mediterranean (DOUMENGE, 1995). In 1994, PIAZZI et al. (1994) observed the presence of flat tufts of *C. racemosa*, 10-15 cm thick, on the Meloria shoals, emphasizing a north-westernwards extension of its distribution area. The morphology of the Meloria thalli agrees with that sampled at Genoa-Quinto, allowing to resemble the species to *C. racemosa* var. *clavifera* (SARTONI, 1978); some differences in the dimensions of the erect portions and in the disposal of the spherical parts, besides, reconfirm the high morphological plasticity of the species and suggest to investigate the existence of a Mediterranean variety evolved during the east-west migration.

The presence of *C. racemosa* along the coast of Genoa occurred in an environment characterized by organic waste; DOUMENGE (1995) stressed that the species of the genus *Caulerpa* result to prefer polluted environments and proposed that they can be considered as indicators of environmental alterations. In fact, the *Posidonia oceanica* bed in the neighbourhood of the Genoa-Quinto site shows an evident regression of the upper limit and the fish fauna is characterized by a low diversity (data not yet published).

However, the development of the Genoa settlement must be surveyed with care to follow its local extension and geographical spread and to detect the possible impact on the local biocoenoses.

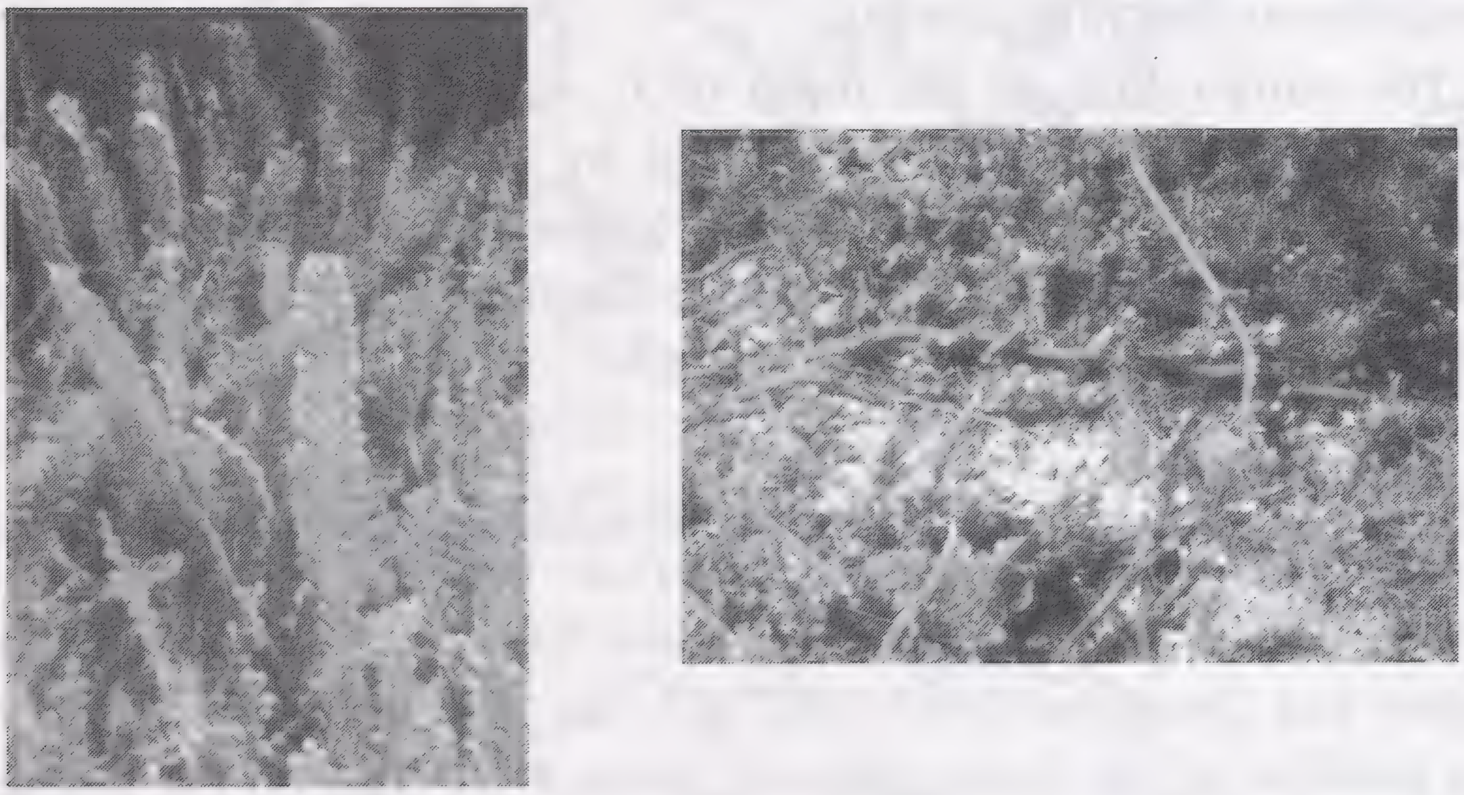

Fig. 2 A - Morphology of the thalli of *Caulerpa racemosa* from Genoa-Quinto in October 1995.

Fig. 2 B - Morphology of the thalli of *Caulerpa racemosa* from Genoa-Quinto in December 1995.

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RIASSUNTO

In questa nota viene riportato il rinvenimento davanti alla costa della città di Genova (Mar Ligure, Italia) dell'alga appartenente alla specie *Caulerpa racemosa* (Forsskal) J. Agardh. (Chlorophyceae, Caulerpales). Questa segnalazione, a tutt'oggi la più settentrionale, rappresenta la testimonianza della notevole capacità di dispersione di quest'alga tropicale entrata in Mediterraneo attraverso il Canale di Suez. Sono infine riportate alcune caratteristiche morfologiche e biometriche di quest'alga che sembra presentare, oltre ad una notevole adattabilità alle condizioni ambientali, anche una non trascurabile variabilità morfologica.

ABSTRACT

In this work we report the presence of a little settlement of the alga *Caulerpa racemosa* (Forsskal) J. Agardh. (Chlorophyceae, Caulerpales) along the coast of Genoa city (Ligurian sea, Italy). This occurrence emphasizes the high adaptability and the remarkable ability to spread showed by this tropical alga, which penetrated in the Mediterranean Sea from the Red Sea via the Suez Canal. We describe, also, some morphological and biometrical characteristics of the alga, which shows a high adaptability to the environmental conditions and a not negligible morphological plasticity.